

## ***Rapid Spacecraft Development Office News***

***September 2000***

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## **A Message from the Chief of the RSDO**

Greetings! Life continues to be active here at RSDO. We are in the midst of evaluating the proposals obtained in August as a result of the second Rapid II on-ramp opportunity. We received eight proposals from six vendors; if all are accepted, it will result in a 50% growth in the number of catalog buses we offer. The Phase A accommodation study for the Magnetospheric Multiscale (MMS) mission was recently completed (see the article in this issue for details) and we anticipate that an additional delta Phase A study will soon be conducted to adjust for the findings from the first study. We are also preparing to host a Vendor/Customer Workshop in early to mid December here at GSFC. This meeting will enable us to meet and share information about our future endeavors.

In addition, we have some staff changes to report. In June, it was announced that I would become the new Chief of the RSDO. I am pleased to have received this appointment, and look forward to continuing to work with the RSDO team in this exciting and ground-breaking business. We also have a new RSDO Associate Chief, Bruce Clark. Bruce was the manager of the Orbital Launch Services Project at GSFC, and has a wealth of experience working with both government and industry. Please read the short biographical sketch of Bruce in this issue to acquaint yourself further.

RSDO personnel are participating in several relevant conferences and meetings, as well. Bruce Clark and I attended the Fourteenth Annual Conference on Small Satellites at Utah State University August 21-24. Ron Miller will be presenting a paper titled, "Rapid Spacecraft Acquisition" (Paper IAA.11.3.08) at the International Astronomical Federation's 51st International Astronautical Congress in Rio de Janeiro in early October. The RSDO will also be featured in the GSFC Engineering Colloquium on October 2, in the Building 3 auditorium, where I will present a talk entitled, "Using the Spacecraft Supermarket: Results and Lessons Learned."

There are a number of interesting articles in this issue of the newsletter. In addition to the MMS study report mentioned above, there are articles about the "Fair Opportunity to be Considered" process utilized for the Lightweight Rain Radiometer (LRR) procurement, and a description of how the findings from NASA's investigation into the Mars mission failures may have implications for the RSDO. Moreover, we have included an on-line version (pdf) of our new informational brochure, that can be viewed on screen or downloaded. Also in this issue is an article detailing the RSDO's recent selection as a winner in the first annual Business Solutions in the Public Interest Award. This award recognizes "acquisition teams and agency leaders who have used acquisition effectively and creatively to help achieve agency missions."

Finally, I would like to thank the vendors who have provided us with feedback (both positive and negative) regarding the Rapid II process. We are open to your comments, and will strive to improve our satellite acquisition services.

As always, please feel free to contact me via email ([bill.watson@gsfc.nasa.gov](mailto:bill.watson@gsfc.nasa.gov)) or telephone (301.286.1289) if you have any comments or questions regarding RSDO business.

***Bill Watson/Chief of the RSDO***

## **Staffing Updates**

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### **Meet Bruce Clark**

As of June 2000, the RSDO has a new Associate Chief: Bruce Clark. Prior to his arrival at RSDO, Bruce managed the Orbital Launch Services Project at GSFC. That project was responsible for providing all NASA launch services on multiple vehicles, including the Delta, Pegasus, Scout, Titan-II, and Atlas-E/F. Bruce also pioneered the GSFC transition from Government ownership of the rockets to the present era of procurement of launch services from multiple commercial providers—a concept very similar to the RSDO's Rapid Spacecraft Acquisition process. Before his career in the rocket world, Bruce worked for 20 years in industry and NASA on various aspects of spacecraft and subsystem design, analysis, test, integration and operations. He is a 1960 graduate of Queens College with a B.S. in Physics. Bruce's passions in private life are playing bluegrass banjo, playing soccer, and ballroom dancing. Welcome, Bruce!

## **The Contracting Officer's Corner**

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### **Small Disadvantaged Business Information**

We encourage all our vendors to consider the use of small or disadvantaged businesses when enacting subcontracting agreements. For more information on official policies and goals concerning the integration of these companies into the NASA business environment, please visit the web site of NASA's Office of Small and Disadvantaged Business Utilization (OSDBU) at <http://www.hq.nasa.gov/office/codek/>.

### MMS Study Complete

The Magnetospheric Multiscale (MMS) mission recently conducted Phase A studies with four spacecraft vendors selected through the Rapid Spacecraft Development Office (RSDO). The four vendors are Ball, Orbital, Spectrum Astro and Surrey.

MMS is the third mission in the Solar Terrestrial Probes (STP) line. The MMS mission will use four or five identically instrumented spacecraft, flying in formation, to investigate magnetic reconnection, charged particle acceleration, and turbulence in key boundary regions of the Earth's magnetosphere.

MMS is an extremely challenging mission for the available funding. The mission trajectory includes four different orbit phases, with orbit inclinations ranging from 10 to 90 degrees. A double lunar swing-by is required to achieve the inclination change. The total delta-V required for the mission is 1100 m/s. The propulsion system required to support this delta-V drives the spacecraft's mechanical design, making the accommodation of five spacecraft within the launch vehicle fairing difficult. In addition, the MMS instruments require four 40-meter radial booms, and two six-meter axial booms. Requirements to accommodate the stowed booms, deploy the booms, and maintain spacecraft stability during and after boom deployment, drive both the mechanical and attitude control system designs. Finally, since the mission carries experiments studying plasma and charged particles, the spacecraft requires a high level of magnetic cleanliness.

The purpose of the study was to demonstrate the feasibility of the MMS mission. The study focused on six areas that are critical to MMS. These areas are: developing a mission architecture, with five spacecraft that fit in the Delta 7925 ten-foot fairing including adequate clearances; developing a strategy for the initial separation of all five spacecraft from the launch vehicle and the subsequent individual spacecraft separations; instrument accommodations; developing an attitude determination approach that provides spin axis knowledge of 0.1 degrees at a 20 rpm spin rate; evaluating alternate approaches to the inter-spacecraft ranging and alarm system; and developing a fabrication, assembly, integration and test approach that supports the MMS schedule for a June 2006 launch.

The vendors' work on the studies was instrumental in identifying mission design areas that drive the mission cost and feasibility. As a result of these studies, the MMS Science and Technology Definition Team (STDT) met at GSFC on August 31, 2000 to discuss changes to the mission design that will permit MMS to remain within the STP cost cap for the implementation phase. The STP office anticipates following these studies with a "Delta" Phase A in Fall 2000 to study the revised mission defined by the STDT.

***By Mary DiJoseph/STP Formulation Manager/GSFC Code 740.2***

## **"Fair Opportunity" Clause Used for Lightweight Rain Radiometer Study**

The Rapid II procurement contains a provision which allows RSDO to quickly award certain orders, without undergoing the proposal process. The "Procedures for Fair Opportunity for Consideration" clause [I.A.7(a)] enables RSDO to consider all Rapid II spacecraft (and therefore all vendors) for award of an order.

Using the "Fair Opportunity" clause, the customer first writes a Statement of Work (SOW) defining the work to be done and indicates the number of Delivery Orders (DO) that can be awarded. The customer specifies a set of primary mission performance criteria, including acceptable limits for each item. For example, mission requirements may stipulate a mission lifetime criteria of five years, with an acceptable limit greater or equal to two years. The customer may also propose a set of secondary criteria to be used to further assist in the selection process.

Next, RSDO representatives meet with the customer to review the Rapid II catalog, and determine which spacecraft meet the specified criteria. Then the qualified vendors are each sent the SOW in a Delivery Order containing a price and work schedule. Vendors then make the decision whether to accept or refuse the DO; they can also propose alternate conditions, such as schedule or price, to be considered by the customer. Once the vendor(s) and customer accept the conditions of the DO, it is managed just like any other RSDO DO.

Customers using the "Procedures for Fair Opportunity for Consideration" experience many advantages. The process can be completed in as little as two weeks, and is conducted in a very fair manner, with all spacecraft buses considered for the award. It is particularly useful for procurements where multiple DOs will be awarded. On the other hand, this procedure may not be as appropriate for contracts where only a single DO can be awarded—it may appear as if a preference for a certain vendor exists. In addition, vendors do not receive much warning from the government that a DO is in the works, and therefore do not have much time to prepare a response. The vendors do, however, receive an email notification telling them that there is a requirement in the works that will use the "Fair Opportunity to be Considered" clause. The vendors are also notified of the evaluation criteria the Government will use to make selections under the clause.

This process was recently utilized to select vendors for an Accommodation Study for the Lightweight Rainfall Radiometer (LRR). The purpose of the study was to investigate whether the LRR instrument could be accommodated on board an RSDO spacecraft in either of two different launch configurations. The process went fairly smoothly, and four vendors were selected to perform the study:

- Ball Aerospace (BCP 600)
- Orbital Corporation (LeoStar and MicroStar)
- Spectrum Astro (SA-200S)
- TRW (T200B)

To view/download the Delivery Order Decision Document from the LRR Accommodation Study procurement, please click on the following link:  
[http://rsdo.gsfc.nasa.gov/rapidii/downloads/LRR\\_decision.pdf](http://rsdo.gsfc.nasa.gov/rapidii/downloads/LRR_decision.pdf).

We learned some valuable lessons from the LRR procurement experience. First, it is best to keep the award criteria simple and broad. Some criteria should not have acceptable limits with both an upper and lower range specified; rather only a minimum or maximum should be stipulated. All parties involved (RSDO, customers, and vendors) should understand the process fully before commencing, because once the course of action is underway, it moves very quickly. Pre-screening the criteria would be useful to assure adequate representation in the resultant set of qualifying vendors. If too many or too few vendors are excluded in the

pre-screen, a revision of the criteria or SOW should be considered.

Overall, use of the "Fair Opportunity for Consideration" clause can be very beneficial in the right circumstances. Project Formulation Managers should keep this option in mind as a nifty tool that may speed and ease the procurement process.

***By Jim Adams/Global Precipitation Measurement/GSFC Code 740***

## SMEX and MIDEX: Potential Candidates for RSDO

Recently, a study was conducted by the Office of Space Science to compare the capabilities of RSDO catalog buses (Rapid I) and Spartan, with the collected mission requirements of MIDEX (35 proposals submitted in 1998) and SMEX (52 proposals submitted in 1997) applicants. For each bus and parameter, the percentage of SMEX and MIDEX missions which can be satisfied by that bus was calculated.

In this matrix, the percentage of Small Explorer (SMEX) and Medium Explorer (MIDEX) missions which can be supported by each RSDO bus is shown for seven parameters. Under the heading for each bus, are two columns of numbers. The left column indicates the bus capability for that particular parameter. The right column indicates the percentage of both SMEX and MIDEX missions which are satisfied by this level of capability. The values are color-coded to aid in identification. Green indicates satisfaction of more than 90% of all SMEX and MIDEX missions. Yellow indicates 70-89% satisfaction, orange for 50-69%, and red designates that less than 50% of the missions could be satisfied.

	BaII RS2000	LM-100	LM-900	OSC Starbus	LS-400	SA 200HP
Instrument Mass (kg)	<=340 80%	<=24 11%	<=500 86%	<=200 70%	<=350 80%	<=300 77%
Lifetime (m)	<=60 99%	<=36 93%	<=72 99%	<=120 100%	<=90 100%	<=60 99%
Pointing Knowledge (arcsec)	>=3 80%	>=3600 9%	>=10 75%	>=108 45%	>=3.6 75%	>=1 95%
Pointing Control (arcsec)	>=103 67%	>=7200 21%	>=12 88%	>=144 67%	>=72 67%	>=20 88%
EOL Power (W)	N/D	<=200 52%	<=1082 91%	N/D	<=1300 94%	<=3000 100%
Data Downlink Rate (Mbps)	<=320 100%	<=0.0036 4%	<=320 100%	<=50 96%	<=3 68%	<=10 88%
On-Board Data Storage (GB)	<=25 93%	<=0 3%	<=10 88%	N/D	<=1.25 63%	<=7.5 87%

  

	SA 200LL	SSTL Microsat	Swales Rapid	TRW SSTI 750	TRW STEP-E XC	Spartan 400
Instrument Mass (kg)	<=500 86%	<=35 17%	<=200 70%	<=1000 97%	<=318 79%	<=907 97%
Lifetime (m)	<=60 99%	<=36 93%	<=18 32%	<=72 99%	<=60 99%	<=12 24%
Pointing Knowledge (arcsec)	>=1 95%	>=18000 2%	>=20 69%	>=10 75%	>=36 58%	N/D
Pointing Control (arcsec)	>=20 88%	>=18000 7%	>=23 88%	>=108 67%	>=108 67%	>=60 81%
EOL Power (W)	<=1500 97%	<=22 2%	<=300 56%	<=750 88%	<=250 56%	<=640 86%
Data Downlink Rate (Mbps)	<=20 90%	N/D	<=4 84%	<=150 99%	<=46 94%	<=2 59%
On-Board Data Storage (GB)	<=7.5 87%	N/D	N/D	<=12 88%	<=8 87%	N/D

	90-100%
	70-89%
	50-69%
	<50%
N/D	No Data

From the data in the matrix it is evident that a large percentage of these programs' requirements are within the capability of the Rapid buses. Thus, the RSA contracts buses seem to be on target to meet customer needs. It is interesting to note that the buses with low percentages (LM100, SSTL Microsat, and Swales Rapid) are no longer offered in Rapid II—a transition in response to customer demands.

*By Bill Watson/Chief of the RSDO*

*For additional information regarding this study, please contact the author at (301) 286-1289.*

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## **Rapid II On-Ramp News**

Proposals for the second Rapid II On-Ramp were due August 31. On-ramp opportunities allow new vendors to enter products into the Rapid II catalog, and existing vendors to add new buses. Bruce Clark is leading the team that is currently in the midst of evaluating and reviewing the multiple proposals received. We anticipate the review process to last the remainder of September, and discussions and visits to new vendor sites are expected to occur in early October. Revised proposals and model contracts will be requested subsequently, and will be due in early November. Final Rapid II On-Ramp awards will be announced in mid-November.

Please direct any comments and questions regarding the on-ramp process to Jerry Edmond (301) 286-7586. While evaluations are ongoing, the questions to which we can respond will be limited, but we will gladly assist callers as much as possible.

***By Bill Watson/Chief of the RSDO***

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## **Mars Mission Studies May Impact RSDO**

During April and May 2000, a specially appointed team studied the issues related to the prior failures of the NASA Mars missions. The team's goal was to determine a sound application of those lessons learned to GSFC. The team began with a thorough review of the four study reports that had been commissioned by NASA, determining how to tailor the lessons and extract the pertinent wisdom that relates to specific GSFC Project culture.

In general, the team found that the reports contain a wealth of sound information regarding program and project management. Fourteen high level recommendations were presented to, and embraced by GSFC Management, and are to be implemented as soon as practical. Most relate to program and project management practices within the civil service structure on Center, but several of these recommendations could have direct or indirect impact to future RSDO business:

### **POTENTIAL EXPLICIT TASKS**

- Perform specific risk assessment and management items, including Probabilistic Risk Assessment (PRA), Fault Tree Analyses (FTA), and Failure Modes and Effects Analyses (FMEA)
- Provide for high fidelity simulators

### **POTENTIAL INDIRECT IMPACT**

- Expanded NASA/Contractor Integrated Product Teams (IPT) such as on QuikSCAT
- Extensive Verification & Validation testing of hardware and software as close to flight expectations as possible
- Ensure phase-over of the development team into flight operations support
- Aggressively integrate leading edge technologies that contribute to reduced cost and risk

At this time, it does not appear that any of the recommendations will cause RSDO to change any aspects of the basic IDIQ Rapid-II contract. However, there is a likelihood that some aspects may turn up in the mission unique requirements that are assembled when a customer engages RSDO in a mini-competition for a bus delivery order. It will be good for all of us to anticipate this possibility.

***By Bruce Clark/ Associate Chief, RSDO***

For further discussion, contact Bill Watson ([bill.watson@gsfc.nasa.gov](mailto:bill.watson@gsfc.nasa.gov)) or Bruce Clark ([bruce.w.clark.1@gsfc.nasa.gov](mailto:bruce.w.clark.1@gsfc.nasa.gov)).

## **RSDO Announcements**

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### **New RSDO Brochure Available**

The RSDO has developed a new informational brochure describing our capabilities and services. Please click on the following link to view/download the file in Portable Document Format (pdf).

### **Coming in December: RSDO Vendor/Customer Workshop**

In early to mid December, the RSDO will host a workshop for current and potential vendors and customers. This meeting will provide participants with an opportunity to meet and share information. Potential customers will present information about the requirements of future missions. Question and answer sessions with current customers will be held, so that we may learn from missions which are currently supported by RSDO. In addition, there will be a "tutorial" session, where we will review RSDO programs and business processes. The workshop will be held in the vicinity of GSFC. Additional details will be provided via email announcements and notices on the RSDO website. Please plan to attend this important event!

For more information, contact Ron Miller/RSDO Mission Integration Manager at (301) 286-6331.

## Awards and Honors

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### RSDO Wins Again!

We are pleased to announce that the RSDO was selected as a winner of the first annual Business Solutions in the Public Interest Award. This award, administered by Government Executive magazine and the Council for Excellence in Government, in partnership with the Office of Federal Procurement Policy, is for the purposes of "identifying and celebrating acquisition teams and agency leaders who have used acquisition effectively and creatively to help achieve agency missions."

The RSDO was nominated on the basis of successful implementation of the Rapid Spacecraft Acquisition (RSA) program. RSA exemplifies the spirit of the Business Solutions in the Public Interest Award. The program has enabled tremendous decreases in the time it takes to award a spacecraft delivery contract, the time required for product delivery, and total mission cost. RSA is also helping to further NASA's goal of outsourcing the satellite building process, so that more government resources can be devoted to research and development.



In late April, we received notification that the RSDO was selected as one of fourteen finalists for this award, out of over 120 nominated institutions. On May 10, former RSDO Chief, Jim Adams, presented a brief synopsis of the RSDO's RSA program before the selection committee. The six winning organizations are featured in the August issue of Government Executive, and are also profiled on the magazine's web site: <http://www.govexec.com/top200/2000top/00tops1.htm>. In addition, the winners will be honored at a reception to be held later this month.

We at RSDO are very happy to have received this recognition of our efforts, and are striving to further improve NASA's satellite acquisition processes.